



Parabolic plane

JSC's zero-gravity inducing KC-135 airplane is coming up on its 40,000th parabola. Story on Page 3.



Here, Rover

NASA is developing a planetary rover to support future manned and unmanned exploration efforts. Story on Page 4.

Space News Roundup

Vol. 29

June 29, 1990

No. 26

Texas-sized lab to begin robot work

By James Hartsfield

A laboratory as big as Texas employing the state's brightest students will soon be put to work with NASA to aid in developing robotics for Space Station *Freedom*.

The NASA/JSC Universities Space Automation and Robotics Consortium unveiled Wednesday will link robotics laboratories at Rice University, the University of Texas, the University of Texas at Arlington and Texas A&M University with JSC labs to study the robotics tasks planned for Space Station *Freedom*.

The labs will be interconnected by a computer network to allow the universities to remotely control each other's robots as well as those at JSC. Experiments can then be carried out in what will essentially be a statewide lab. The project, proposed to NASA by the four schools, will be funded by a \$240,000 grant to begin before October.

The consortium was formed by the schools in 1989, all of which, excluding UTA, have been participants in past NASA robotics research.

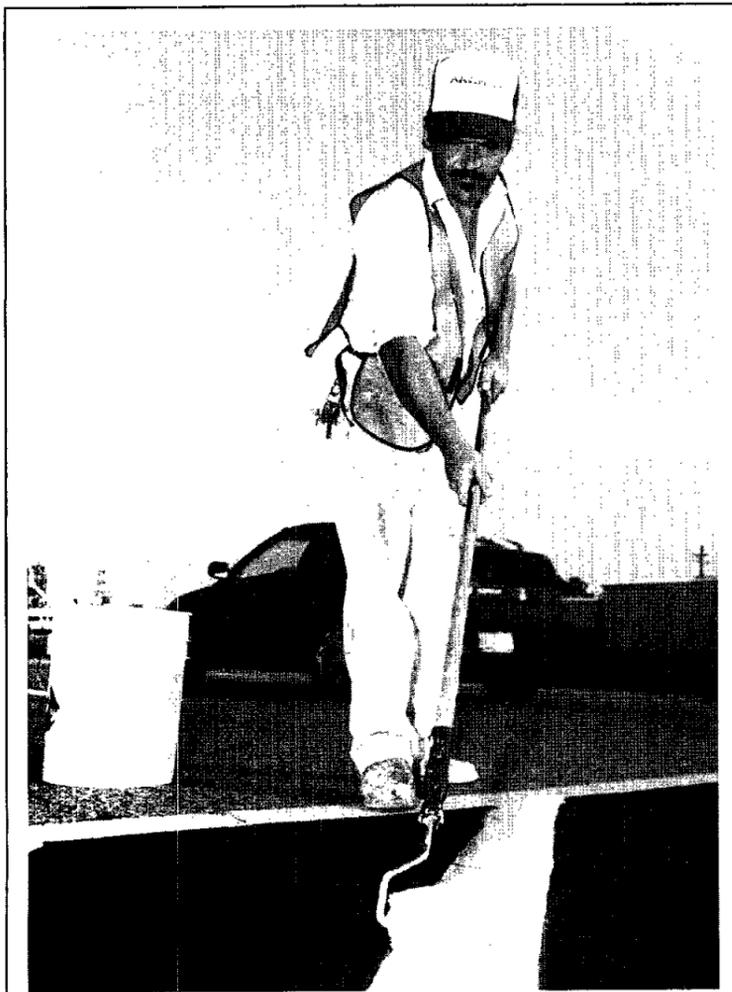
"With the interconnected labs and the consortium, we'll be able to take advantage of all the different areas of expertise exhibited by the schools," said Carl Adams, NASA project engineer. The schools' areas of expertise include the machine vision and mobile robotics at Rice; manual controllers and modular robot architectures at UT; system architectures and artificial intelligence at A&M; and human performance and workloads at UTA.

"People today use computer networks to exchange data, but we'll be using this network to control robots at the four universities and the JSC labs from remote facilities," said Prof. Rui de Figueiredo, Rice researcher and consortium chairman. "The universities got together and approached NASA with the idea to better coordinate our efforts and areas of specialty. It's a logical arrangement."

The four universities jointly presented the proposed consortium to NASA, where Charles R. Price, chief of the Robotic Systems Development Branch at JSC, suggested a computer link among the labs to study simultaneous control of multiple robots.

The universities' areas of expertise are complementary, and, in addition

Please see **ROBOT**, Page 4



JSC Photo by Scott Wickes

EARNING HIS STRIPES—Painter Daniel Ocker puts a fresh coat of stripes on the crosswalk at Fifth Street and Avenue B. The crosswalk is just one of many being repainted this summer as Anchor Inc., JSC's painting contractor, gives all of the center's crosswalk, street and curb markings a facelift. Lines at Ellington Field and all of the liquid nitrogen tanks on site also will be repainted before the job is done in September.

Mirror flaw inside Hubble warps focus

By Pam Alloway

A focusing flaw in the Hubble Space Telescope's optical system is producing distorted images and will postpone some scientific objectives, NASA officials said Wednesday.

Officials said they believe the flaw occurred during manufacturing of either the primary or the secondary mirror inside the \$1.5 billion telescope. NASA has formed a special review panel, chaired by Jet Propulsion Laboratory Director Lew Allen, to investigate the problem.

The HST's inability to focus light properly appears to be linked to a defect in one of the telescope's mirrors and cannot be corrected by instructions sent from ground controllers. The telescope's inability to clearly focus on objects affects the quality of any photographs it takes, said Dr. Ed Weiler, Hubble program scientist.

Hubble's Wide-field Planetary Camera is considered one of the telescope's most important instruments. Using electronic sensors instead of film, the camera was designed to search for planets in other solar systems, locate black holes and determine how galaxies age. The European designed Faint-Object Camera also plays an important role in Hubble's mission. It was designed

to see faint objects in fine detail.

A shuttle flight already was scheduled in 1993 for routine maintenance on the telescope and the installation of second-generation cameras. Officials said Wednesday the design of the second generation cameras can be changed to correct the problem.

"HST was and is a difficult challenge," Weiler said. "It would be dishonest for me to say the mood of the scientists is very happy right now. We're all frustrated. But we should be able to fix it. Nobody's walking away."

Other scientific work involving the HST will continue but in a different sequence than originally planned. The telescope's activities will shift to spectroscopy, the analysis of colors of light emitted from stars. Such analysis will enable scientists to determine the nature and composition of stars. Experiments using ultraviolet light also will continue, unaffected by the telescope's latest problem.

Engineers discovered the focusing problem, referred to as a "spherical aberration," when they attempted to fine-tune the telescope and could not get a clear image, said Jean Olivier, deputy project manager from Marshall Space Flight Center. A spherical aberration occurs when all the light

Please see **HUBBLE**, Page 4

Managers discuss Atlantis launch

By Kyle Herring

Shuttle managers met Thursday and today to determine an official launch target date for the STS-38 Department of Defense flight aboard *Atlantis*.

This morning, workers were scheduled to load liquid hydrogen into *Atlantis*' external tank to verify that the system is ready to support a full tanking for launch. A real-time decision on whether to go ahead with the tanking test was to be made based on the weather conditions at the launch site.

The mini tanking test, designed to ensure that a problem similar to the one that postponed the STS-35 launch does not exist in the STS-38 stack, entailed sending super-cold liquid

hydrogen through the orbiter's aft compartment into the external tank via the 17-inch umbilical disconnect lines.

Also this week, Space Shuttle Director Robert Crippen approved the removal and replacement of the orbiter side 17-inch disconnect on *Columbia*. The replacement hardware that will be used was removed from the partially completed Space Shuttle *Endeavour* and shipped to the Kennedy Space Center on Thursday.

Columbia remains in the Orbiter Processing Facility while troubleshoot-

ing continues to locate a leak discovered during tanking for its May 29 launch.

The Astro-1 mission is now scheduled for mid-August pending conclusion of the testing at Rockwell to isolate the leak.

The 17-inch disconnect on *Columbia* was scheduled to be removed today and shipped to Rockwell for testing beginning early next week. A new 17-inch valve was installed on the STS-35 external tank last week. All leak checks have been performed and electrical connections are being made.

In preparation for *Atlantis*' mini-tanking test, the aft compartment was inspected and closed out. The rotating service structure was to be moved away from the orbiter for the test.

Last weekend, workers conducted the helium signature leak test of the main propulsion system and three main engines. The test did not identify any leaks in the system.

Earlier this week, hypergolic loading operations were held up about one shift when a transformer shorted out bringing down the system that supplies cooled air to the Launch Control Center. The cooled air keeps the computers at the proper temperature

Please see **ATLANTIS**, Page 4



STS-38

Simulators get new computers

Some astronauts already training on smaller, faster GPCs

By Pam Alloway

Upgraded General Purpose Computers (GPCs) for the space shuttles that are faster and smaller than their forerunners are clicking away in JSC simulators in preparation for their first flight, possibly in early 1991.

Ten upgraded GPCs have been installed in Bldg. 5's fixed and motion base simulators. An additional five GPCs were installed in Bldg. 35's guidance and navigation simulator. Another five units are at Rockwell's Palmdale, Calif., facility awaiting installation in NASA's newest orbiter, *Endeavour*.

Following years of validation testing, the second generation of GPCs soon will replace the computers that initiate every flight control function aboard the

orbiters, including the movement of all aerodynamic surfaces and control of the main engines.

A dedicated, specific computer load used in astronaut training has been available for crew training exercises since May 22, said Maurice Walters. Walters is NASA's Simulation Interface Device/GPC support monitor for the IBM contract. Crew members will train on the upgraded GPCs for six months before flying with them on board. About 10 astronauts have trained on the new GPCs since May, he said.

"There are no major operational differences between using the new and the old GPCs," Walters said.

The upgraded GPCs will provide 2.5 times

Please see **SIMULATORS**, Page 4



There will be much more memory capability on the new computers.

—Maurice Walters



Photo by David Nance

IBM Engineers Dave Stauffer, Tony Shakarizaz and Marvin Snitkoff test the final version of the Simulation Interface Device in Bldg. 5. The device ties the new General Purpose Computers (GPCs) into the Shuttle Mission Simulators (SMS).

JSC

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays.

General Cinema (valid for one year): \$3.75 each.
 AMC Theater (valid until May 1991): \$3.50 each.
 Sea World (San Antonio, year long): adults, \$17.25, (2-day, \$21.95); children (3-11) \$14.75, (2-day, \$18.95).
 Astroworld (valid 1990 season): season, \$39.95; regular, \$15.97; children, \$9.21; Waterworld, \$8.15; 2 day—AW/WW, \$18.47.
 Spaceweek 1990 Banquet (6:30 p.m., July 16, South Shore Harbour Resort & Conference Center: \$35 each before 7/1/90, \$40 each after 7/1/90).
 Las Vegas Trip (Aug. 16-19, 2/3 nights): \$298-369.
 Ringling Bros. and Barnum & Bailey Circus (noon July 14, Summit): \$7.
 Riverraft Trip (July 21, includes transportation, rafting, barbecue dinner): \$35.
 Schlitterbahn Trip (July 21, includes transportation, breakfast, lunch, 17 waterslides, paddleboats, mini golf and more): \$50.

JSC

Gilruth Center News

EAA badges—Dependents and spouses may apply for a photo I.D. 6:30 p.m.-9:30 p.m. Monday-Friday.

Defensive driving—Course is offered from 8 a.m.-5 p.m. Aug. 18 and Sept. 15; cost is \$15.

Weight safety—Required for use of weight room. The next classes will be from 8-9:30 p.m. July 11 and 21; cost is \$4.

Aerobics and exercise—Both classes are ongoing.

Men's Open "C" Softball Tournament—The tournament will be June 30 and July 1. Entry fee is \$95, limited to 16 teams, due 7 p.m. June 28.

Ballroom dance—Classes begin Aug. 2 and meet every Thursday for eight weeks. Beginning and advanced classes meet 7-8:15 p.m. Intermediate class meets 8:15-9:30 p.m. Cost is \$60 per couple.

Tennis—Sign-ups begin immediately for tennis lessons. Beginning class will be at 5:15-6:45 p.m. on Mondays for six weeks beginning July 9. Advanced beginner will be offered on Wednesdays beginning July 11. The cost is \$32.

Scuba—Class starts July 16 and runs for four weeks. Cost is \$45 at time of sign-up, plus additional fees.

JSC

Technical Library News

These new publications are available in the JSC Technical Library, Bldg. 45, Rm. 100.

Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold S. Kerzner.

How to Conduct Training Seminars, Lawrence S. Munson.

Listen and Learn Japanese, Dover Publications.

Computer Viruses, Worms, Data Diddlers, Killer Programs, and Other Threats to Your System: What They Are, How They Work, and How to Defend Your PC, MAC, or Mainframe, John McAfee.

R:Base Solutions: Applications and Resources, Que Corp.

JSC

Swap Shop

Property
 Rent: Pasadena, 3-1-2, furn., AC/heat, new paint, stor., trees, priv. fence, immed. occupancy. 472-6980.
 Sale: Heritage Park, 4-2-5-2, 2,200 sq. ft., 2-story, den w/FPL, fans, 5 yrs. old, assume K, \$98,700. 996-0990.
 Sale/Lease: 4-2-2, \$705 or \$725/mo., Heritage Pk. Edward Ingram, 335-2542.
 Rent: Room in Sageglenn house, parties O.K., free maid, \$270/mo., util. pd. Enc, x38720.
 Waterfront lake lot, Wildwood, \$13,500, 35 mi. from Beaumont. Rick, x36159 or 925-4588.
 Lease: Bayglen, 3-2-5-2 w/garden bath, miniblinds, fans, island kitch., microwave, gar. door opener, avail. July 1, \$975/mo. Ruben, x33829 or 486-0817.
 Sale: Nassau Bay, 4-2-2, formals, Florida rm., spa, deck, near JSC. Jeanne, 488-1310.
 Sale: Friendswood, 3-2-2, 1,500 sq. ft., brick, trees, deck, assum. 10% FHA, \$68K. 482-6651.
 Sale/Lease: Heritage Pk., 3-2-2, 1,700 sq. ft., \$75K or \$750/mo. plus dep. x38074.
 Sale: 60 acres on Hwy. 80, 3 mi. from Karnes City, TX, 50 mi. from San Antonio, 2-story house on 1.5 lots w/fruit trees. 783-9164.
 Sale: L.C., 4-2-2, 4-2-2, 1,800 sq. ft., new AC, dishwasher, oven, owner will nego. x31236 or 554-6180.
 Sale: 2-2 furn. condo, sleeps 6, pool, hot tub, steam, w/ rm., 45 min. from JSC, \$12K. Steve, x38204 or (409) 938-3171.
 Sale: Lot on Lake Livingston, Westwood Shores, 60x115, util. avail., \$9,500, OBO. x30032 or x31834.
 Rent: Bellaire house, 3-1, CA/H, remod., stor., avail. mid Aug. \$625/mo. 488-2664.
 Sale: Friendswood, 3-2-2, Gunite pool, 2K sq. ft., new paint/carpet, fans, \$88,500. x34902 or 996-9128.
 Sale: Pebblebrook condo, 1-1, FPL, W/D, frg. w/ icemaker, 9% convn., assum. fixed rate, low equity, x37426 or 326-5200.
 Sale: Lake Livingston, Waterwood, 2-1, 2-story on 1/4 acre, CA, H, dbl. CP, Robert Kline, 870-0090.
 Rent: Galv. condo, Seawall & 61st St., sleeps 6, wknd./wkly. rate, furn., cab. TV, x33479 or 486-0788.
 Sale: Heights, 3-2-2, remod., CA/H, FPL, game room, deck, porch swing, Tom, x31418.
 Sale: Lot, Wildwood, 35 mi. from Beaumont, \$1K. Rick, x36159 or 925-4588.
 Rent: Lake Livingston, 3-2, waterfront, CA H, furn., decks, pier, ex. cond., wk. wknd. rates. 482-1582.

Cars & Trucks
 '88 Acura Integra LS, 2.7K mi., AC, PW PL, AM FM, cass. gray, ex. cond., \$11.5K. 996-8410.
 '88 Mustang LX conv., loaded, immac. cond., \$11,200. Chad, x35786 or 334-1852.
 '81 Pontiac T1000, 85K mi., \$350. 283-5408 or 326-1953.
 '80 Fiat Spider conv., AC, 57K mi., ex. cond., \$4,200. Mark, 474-2195.
 '88 Eddie Bauer Bronco II, V6, loaded, immac. cond., 74K mi., \$7,500, OBO. 332-2229.
 '75 Chevy PU w/ '81 305 eng., \$600; chrome roll bar for fleetside PU. \$50. 473-4433.
 '82 Camaro, T-Tops, 4-spd., low mi., ex. cond., \$3,450. 998-0407.
 '89 Honda Civic DX, htcblk., auto., 10K mi., ex. cond., \$7,900. 333-7180 or 561-7182.
 '78 Toyota Corolla, \$800. Lucy, 482-0556.
 '63 VW bus, reb. eng., new clutch, runs well, \$600. Carl, x31531 or 486-7851.
 '77 Toyota Celica, stand., needs minor wk. x38204 or 643-7827.

'81 Thunderbird, AC, loaded, \$2,150, OBO. '82 Grand Prix, loaded, \$2,350, OBO. Bob, 283-4146 or 482-4320.
 '58 Chevy Stepside PU, needs wk., \$1K, OBO. Tim, 488-8806 or 488-3436.
 '87 Toyota PU, 32K mi., 5-spd., new tires, ex. cond., \$6,500. Kelvin, x36921 or 488-8173.
 '88 Chevy Dually Ex-cab, loaded, \$13,800. Kelly, x36169 or 925-1819.
 '82 Ford Escort, 66K mi., \$1,500, OBO. 480-3594.
 '80 Honda Accord, 2-dr., 5-spd., new AC/brakes/clutch, \$2K. Paul, x31883 or 532-1516.
 '88 Hyundai GL, 4-dr. sedan, 5-spd., loaded, warr., ex. cond., BO. Becky, x31420 or 488-0556.
 '84 Honda Civic, 4-dr. sedan, auto., ex. cond., \$3,450, OBO. 334-2335.
 '79 Cadillac Seville, loaded, ex. cond., \$5,995; '84 Ford Tempo, 5-spd., 4-dr., \$995. 474-7524.
 '78 Explorer 228 mini motor home, 94K mi., new tires/brakes, Dodge chassis, 12mpg, \$7K. Ray, x31986 or 482-8729.
 '65 Olds Starfire sport coupe, good cond., \$2K, OBO. Tom, x38298 or 488-4089.
 '88 Acura Integra, Special Ed., alarm, warr., \$12.5K, OBO. x32381.
 '85 Buick Electra Park Ave., 4-dr., all pwr., ex. cond., new tires, 66,500 mi., \$6,650. 482-1535.
 '79 Honda Civic, 2-dr., \$700. Anh. 280-2186 or 280-0151.
 '80 Pontiac Phoenix, good cond but trans. needs atten., \$675. x30092 or 481-3637.

Cycles
 '86 Suzuki Savage, 650cc, less than 7K mi., ex. cond., \$1,100. x33335 or 488-7490.
 '81 Honda 900 Custom, CB's, air shocks, saddle bags, ex. cond., \$800. Tim, 996-9191.
 '82 Harley Davidson Sportster XLH, elec. start, ex. cond., low mi., new batt. \$2,875.
 Specialized Sirrus racing bike, 54cm, ex. cond., \$295. 482-2029.
 '89 Yamaha Breeze 4 wheeler, 125cc eng., rack, auto., \$1,950. Phyllis, x30032.
 Schwinn 27" World Sport 10-spd. w/cromoly frame, ex. cond., \$125; Schwinn 27" Le Tour 10-spd., good cond., \$100. Ruben, x33829 or 486-0817.

Boats & Planes
 Main sail for McGregor 25' sail boat, ex. cond. Dick, 326-4684.
 21' deep V bottom w/Merc. 260 OD, PS, solid floatation, ex. cond., \$4,900 nego. Dick, 326-4684.
 '81 '73 Apollo, 150hp Merc. OB, 48mph, stainless steel propeller, trlr., \$1,795, OBO. John, 996-0805.
 '16' '79 Renegade ski boat, 140hp Evin., SST prop, ex. cond., \$3,200, OBO. 333-6868 or 486-7846.
 '17' '86 Thundercraft boat, 140hp, IO, SS prop, trlr., 7-pass, ex. cond., \$6,100, OBO. 486-4963.
 '72 Hollywood trihull w/depend. '73 Chrysler 70hp OB, trlr., new tires/pump batt., \$1,700. 496-3945 or 332-0365.
 '12' Hobie Mono Cat sailboat, trlr., 2 sails, \$400. 280-2523 or 333-1762.
 '26' Yamaha, ex. cond., \$19K; '16' G-Cat, good cond w/ trlr., \$1K. Bryan, x30385 or 335-1559.
 '16' Hobie Cat, 2 sets of sails, harnesses, traps, trlr opt., BO over \$900. John, x38988 or 482-6364.

Audiovisual & Computers
 Sony F-30 8mm Camcorder w/video lt., \$750; Fujica AX-3 cam., Fuji lenses; 50mm, 35-70mm w macro, 135mm Tele, 28mm wide angle; 300 SX strobe flash; auto wind; ex. cond., all for \$500. x33233 or 480-5061.
 Nintendo Three Slooges video cart, new, \$25. x36814.
 IBM PS/2 model 50, loaded, ex. cond., w/desk and chair, \$2,800. x36814.
 Klipsch Heresy II loud spkrs., 2 yrs. old, \$500. Bill, x38544.
 Apple IIc computer, monitor, Imagerwriter II printer, Appleworks SW, full document., expand. RAM, joystick, \$700 nego. Steve, x30652 or 480-2998.
 Apple IIe computer, printer, ink refills, SW, \$800. Amanda, (409) 925-5042.
 IBM PC XT (genuine) w/monitor, HD, keybd., \$875. x30092 or 481-3637.
 Satellite TV sys. w/descrambler, 10' Winegard antenna, 3 yrs. old, ex. cond., warr., \$1,200. Jerry, x38922.
 CD player, Emerson, ex. cond., \$85. 482-3985 or 282-3841.
 Nintendo set, incl. gun, joysticks, 1 game, \$60; Powerglove, \$45; more games, \$30. OBO. Eileen, x39072 or 484-5282.
 Sansui ster. rec. jim, x39421 or 484-4926.

Musical Instruments
 Elec. guitar, Ibanez Roadstar II, 15 watt Peavey amp, distortion pedal, \$150. 474-7524.
 Korg Trident MKII, perform. synthesiser, analog synth., splittable 3 voice, 8 note polyphonic keybd., \$350 or trade for bass amp, x36565 or 532-1812.

Household
 Kingsz wtrbd. w/bookshelf hdbd. pine, \$200. 996-8410.
 Dbl. bed matt and box springs, \$150, OBO. dbl. Papasan w/peach cushion, \$100, OBO; B/W photo paper plus chemicals. \$37-4204.
 DR set, table, 6 chairs, dbl. china cab., \$350; food dehydrator, \$50; L-shaped bunk beds, chest, ex. cond., \$450. x30707 or 488-1262.
 Kingsz wtrbd. w/hdbd., hr., \$200; sewing mach., needs repair, antique cab., \$25; exer. bike, \$20. Susan, 282-3892 or 554-4338.
 Office desk, chair, steel made, good cond., \$60. 480-4160.
 Persian rugs, 9.5x11.4 Kashan, \$3,500; 4x5 Turkaman, \$750. 558-9130.
 Kingsz. BR hdbd., dbl. dresser w/mirr., 2 matching nightstands, \$275. x34641 or 333-3425.
 Mayline oak flat files, 35"x45", 5 drwr. set w/top, \$200, OBO. Anita, x35768 or 996-8569.
 GE side-by-side refrig., ice maker, ice wtr. disp. on door, \$500. Terri, x35775 or 941-2928.
 Queensz. matt., box springs, \$175; 21" color TV, \$50; 4 cu. ft. refrig., \$75; Hoover upright vac. cleaner, \$50; Proctor Silex steam iron, \$15; 8x10 green carpet, \$15; Bogen B/W photo enlarger, \$25; Metronome, \$15. 486-7851.
 6drwr. metal desk, \$25. Don Larson, 481-2195.
 Maple BR set, 2 twin beds, night stand, desk, chair, bach. chest, \$160. Margaret, 488-6724 or 333-2570.
 White French Prov. girls BR set, dbl. canopy bed, 4 drwr. chest, desk & hutch, bach. chest & hutch, \$350. Margaret, 488-6724 or 333-2570.
 Antique oak dining table w/4 chairs, \$150; coffee table, 2 end tables, \$60; floor lamp, \$20; TV cart, \$5; gas grill, \$50; ironing board, \$5. Kathy, 332-0823.
 Sofa, loveseat, mauve/blue floral, \$100; twin box spring, matt. w/frame, \$50; all good cond., antique brass FPL screen w/androns, \$20. 282-3958.
 Bentwood rocker, good cond., \$35; antique dresser, needs minor repairs, BO. Michelle, x31165 or (409) 945-5288.

Wtrbd., Heinz single, solid wood, bkcs. hdbd., 12 drws., \$175. x31911 or 326-4175.
 6 coral resin patio chairs, 9 sm. resin tables, \$5/ea., \$70/all. Angela, 488-5172.
 Round patio table, glass top, white, 40" diam., \$50; white patio umbrella w/stand, 7 1/2" in diam., \$60. Angela, 488-5172.
 Antique mahog. hutch, ex. cond., \$600. Mike, 482-0626.
 Eureka upright hand vac., good cond., \$35. x33233.

Lost & Found
 Found 3 cass. titled, Dream, Believe, and Then You'll Achieve," in parking lot across from fire station. Shelby Lawson, x36611.

Pets & Livestock
 Free Heinz 57 pups, sm. to med., 4 M, 3 F. Gary or Jane, 486-8417.
 Bobwhite Quail, chicks and eggs. Ken A, 388-1504.
 Orange/white and grey/white cats, both neutered, declawed and shots. 554-6202.
 Free 8 wks. old kitten, litter trained. Geraldine, x34080.
 Free kittens, 2 blk., 1 orange tabby, 1 tortoise shell, ready 7/21. Joanna, 333-7266 or 326-2905.
 AKC Cocker Spaniel pup, 5 mos. old, blk./white, \$250. x34945 or (409) 925-6636.
 AKC Collie pups, 9 wks. old, sable/white, tri-color, \$175. 482-8647.
 Baby birds, cockatiels, hand fed, grays, peds. Linda, 484-7834.
 Free blk. Lab, 2 yrs. old, fem., spayed, shots, obedience sch. Frank, x33573 or 480-9376.

Photographic
 Hanimax Motor Marine I underwater. 35mm cam., 35mm, F 2.8 lens, close-up lens, built-in flash, etc., \$395. Kevin, 283-1989 or 532-2181.

Wanted
 Want white wicker baby crib. Beth, 480-2817.
 Want twin or conv. bunk beds, matt. for boys rm. Carla, x32633.
 Want to share lg. house, clean, \$270/mo. Eric, x38420.
 Want Volvo 15" turbo wheel, 5 spokes, in good cond. Vincent, x30874 or 333-1316.
 Want old garden hoses, soaker hoses, will pick up. Richard, 481-1518.
 Want wndw. AC, 8-12,000 BTU, good cond. Harry, x30263.
 Want furniture donation for UT student's house. 326-2190.
 Want garage sale items. 339-1337.
 Want riding mower, eng. working or not, but all else must, up to \$500. 339-1337.
 Want babysitter for 8 mo. old in your home, would prefer sitter w/no more than 2-3 children. Debbie, x33846.
 Want graphing calculator, bicycle rack for car roof, gas edger. 334-4894.
 Want roommate for summer to share 3 BR duplex w/ one or two others. Jana, 338-2588 or 283-4262.
 Want Encyclo. Britannica, 9th ed. or earlier, (1890), full or partial set, also any book published/printed prior to 1890. Ben, 335-2848 or 482-8998.

Miscellaneous
 Spalding golf clubs, executive irons 3 thru SW, 2 yrs old, \$150. Kyie, x38653.
 Astronomical telescope, 12 1/2" diam. mirr., F/4 digital setting circles, \$900. John, 747-3997.
 Toyota PU topper, all alum, full sz., \$135. Tommy,

x38204 or 643-7827.
 Soloflex workout mach. w/leg ext., butterfly attach., new, \$900, OBO. 337-4204.
 Set of Byte computer magazines, June '76-Dec. '84. x30707 or 488-1262.
 Auto. pool cleaner, ex. cond., \$150. Howie, 282-3811 or 482-3985.
 Radar det., Micronta X&K bands, \$75. Howie, 282-3841 or 482-3985.
 Record. typewriters, \$50 to \$150. Bill Tomkins, 534-2276.
 Engagement ring, 18 karat yellow gold, round diamond solitaire, 68 carats w/6 round diamonds, 18 carats. \$1,200. x30874 or 333-1316.
 Sears front-drive, self-propelled mower, catcher, 3 yrs. old, \$65. Jerry, x38922.
 Ladies 14K yellow gold bridal set, 11 diamonds in engagement ring, 10 in band, 1 carat, \$2K. Terry, x33814 or 486-5126.
 General Jet radial tire, P185/75R14, \$10. Randy, x32570.
 Hibiscus plants, 482-5226.
 1/4" plate glass, approx. 3x7, 482-5226.
 Plas. model airplanes, 1/72" scale, WWII, U.S. British, German, etc. P.M. Marchal, 534-3021.
 Power Pal air compressor, 3/4hp/7.5 gal w/access., \$250. 482-0935.
 Sears lifestyle skier/rower, ex. cond., \$175. Brent, x36456 or 486-0389.
 Sears exer. bike, \$90; rowing mach., \$60 or \$135/both. Debbie, x30608.
 Self propelled Lawn Boy mower, \$50. Kim, x36303 or 280-9726.
 2 yr. old elec. typewriters, \$25/ea.; 11" Sony B/W TV, \$35. Bob, x31994.
 Crystal picture frame, Home Beautiful/Germany, 8x10 frame holds 4x6 pic., new, \$20. 486-8716.
 Antique design W/G ring w/13 dia., TW 60, \$275; TX nug. ring w/6 - 3 pt. dia., \$200. Bev, x34015 or 339-1432.
 33" all terrain tires, less than 3K mi., \$300, OBO. Bev, x34015 or 339-1432.
 Whirlpool gas clothes dryer, lg. cap., good cond., \$60; Penncraft 4hp tiller, gas eng., works, \$60. Art, 326-1833.
 Marlin model 43, 12 ga. pump shotgun, \$150. Samouce, x35053 or 482-0702.
 Diamond Marquis solitaire, 60 points, 1/4" band, \$2K; ladies rabbit jacket, sz. med., white, \$20. Michelle, x31165 or (409) 945-5288.
 Water skis, life jackets, low rope, etc., \$100. 532-2082.
 Rear wndw. w/defroster for Nissan PU, \$40; vinyl camper for sm. PU, \$125. 484-5149.
 DP stomach/back exer. mach., max. wgt 130 lbs., \$100. Johnny, x36778 or 922-1811.
 Sears 1/2hp treadmill, \$300; Wards rowing mach., \$125 or \$400/both. Andy, x38277.
 Mikasa crystal serving bowl, new, 7 3/4", \$20. 486-8716.
 Sunbeam Oskar Jr. mini food proc., new, \$25. 486-8716.
 Ladies 14K yellow gold diamond/ruby bracelet, 4 dis., 5 rubies, \$300. Charles, x31153 or 481-2940.
 Apollo Moon Pot by Garriott, \$75; Apollo Moon Bolo by Garriott, \$30. Samouce, x35053 or 482-0702.
 Fischer Price car seat, \$25; chest of dnwrs., dresser, \$200; offshore fishing pole, \$80; rocking horse, \$25. Phil, 282-3600.
 New Sony turntable PS, LX 295, \$50, OBO; port. cass. ster., \$25, OBO; Schwinn 3-spd. womens bike, ex. cond., \$100. OBO. 332-5063.

Today
Cafeteria menu—Special: barbecue link. Entrees: deviled crabs, broiled codfish, liver and onions. Soup: seafood gumbo. Vegetables: buttered corn, green beans, new potatoes.

Monday
Cafeteria menu—Special: chili and macaroni. Entrees: barbecue sliced beef, parmesan steak, spare rib with kraut. Soup: French onion. Vegetables: ranch beans, English peas, mustard greens.

Tuesday
Cafeteria menu—Special: corned beef hash. Entrees: meatballs and spaghetti, liver and onions, baked ham with sauce. Soup: split pea. Vegetables: buttered cabbage, cream style corn, whipped potatoes.

Wednesday
Cafeteria menu—Special: barbecue link. Entrees: cheese enchiladas, roast pork and dressing. Soup: seafood gumbo. Vegetables: pinto beans, Spanish rice, turnip greens.

Thursday
Cafeteria menu—Special: chicken fried steak. Entrees: roast beef with dressing, fried perch, chopped sirloin. Soup: beef and barley. Vegetables: whipped potatoes, peas and carrots, buttered squash.

July 6
Cafeteria menu—Special: fried chicken. Entrees: fried shrimp, baked fish, beef stroganoff. Soup: seafood gumbo. Vegetables: okra and tomatoes, buttered broccoli, carrots in cream sauce.

July 11
JSC Astronomy Seminar—The seminar will be a Rice University videotape featuring Dr. John Imbrie—"Explaining the Ice Ages" from noon-1 p.m. July 11, in Bldg. 31, Rm. 129. For more information contact Al Jackson, x33709.

July 13
Volcano video—The JSC Astronomical Society will have a video presentation of the latest Kilauea eruption at 7:30 p.m. July 13 at the Lunar Planetary Institute. Plans for the upcoming solar eclipse expeditions also will be discussed. For more information contact Anne Hawes, x36923.

July 14
Lunar Rendezvous Run—The 12th annual Ford Aerospace Lunar Rendezvous Run will start at 8 a.m. July 14 at the Gilruth Recreation Center. Entry forms are available at the gym office. Entry fee is \$10 if postmarked by July 1, \$12 by July 7, and \$15 after July 7. Those interested in volunteering for the race should contact Len Topolski, 333-5576, or Brenda Clary, 480-0257.

July 16
Spaceweek banquet—Spaceweek will hold a national banquet at 6:30 p.m. July 16 at the South Shore Harbour Resort & Conference Center, Crystal Ballroom. Dr. Harrison Schmitt will serve as keynote speaker with an introduction by JSC Director Aaron Cohen. Contact Tanya Lyttle, 333-3627, for more information.

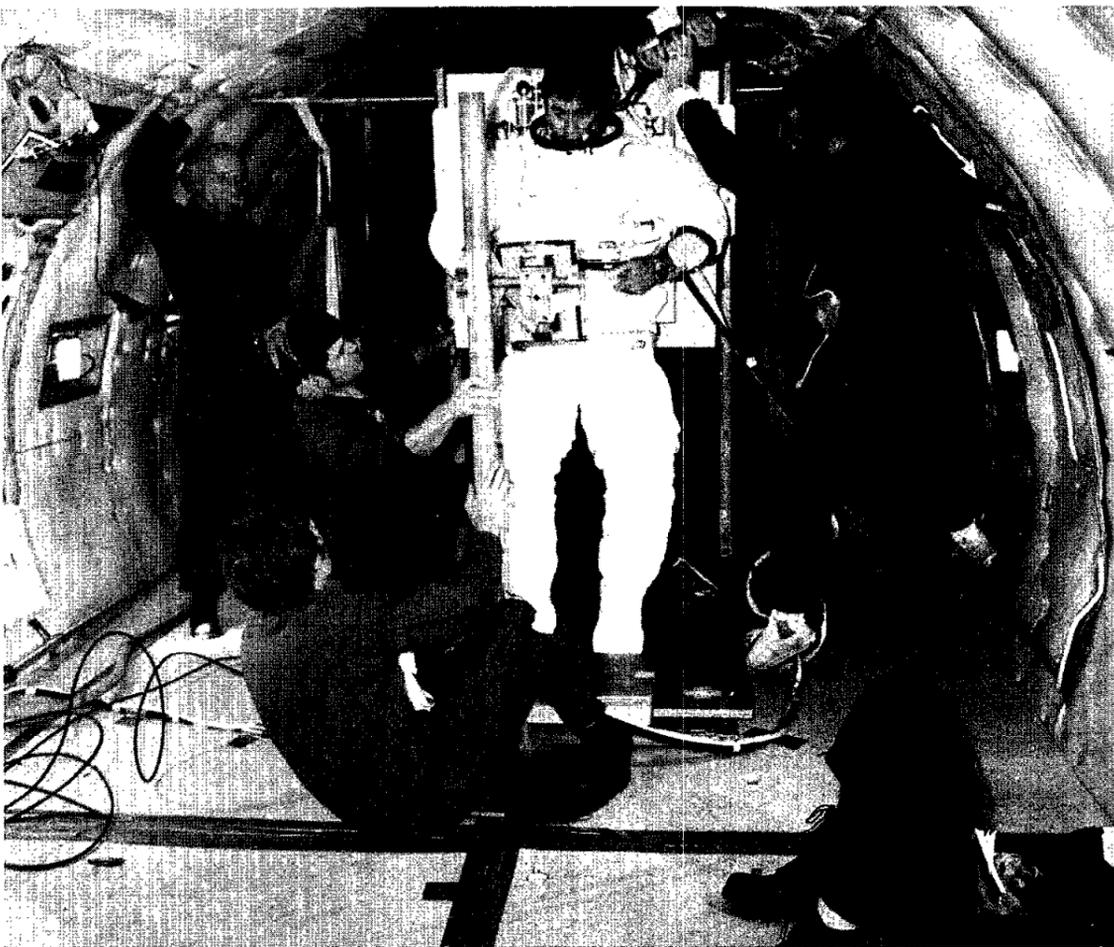
July 18
JSC Astronomy Seminar—The seminar will be an open discussion meeting from noon-1 p.m. July 18 in Bldg. 31, Rm. 129. For more information call Al Jackson, x33709.

July 24
BAPCO meeting—The Bay Area PC Organization (BAPCO) will have its next meeting at 7:30 p.m. July 24 at the League City Bank & Trust. For more information call Earl Rubenstein, x34807, or Tom Kelly, 996-5019.

July 25
JSC Astronomy Seminar—The seminar will be a Rice University videotape featuring Dr. Edison

High Roller

NASA's zero-g airplane coasting toward record 40,000 parabolic rides



By Jeff Carr

NASA's KC-135 airplane, renowned for its unique role as an airborne microgravity test bed, will soon make its 40,000th parabolic zero-g maneuver after 17 years of solid service.

Joe Algranti, assistant director of Flight Crew Operations and former Aircraft Operations Division chief, has flown the KC-135 as much as any NASA pilot. Along with many others who have supported the microgravity program over the years, he takes great pride in the "40k" milestone and appreciates the importance of the aircraft and its mission.

"It's the only big zero-g facility in the free world, and the one in which all U.S. space flight hardware testing and certification has been done," Algranti said. "NASA-930 and her flight test crews have been instrumental in flight qualifying virtually every major piece of shuttle hardware."

Formerly an FAA flight check airplane modified for low-g flying, "NASA-930" has been maintained and operated by JSC's Aircraft Operations Division since 1973.

In 1981, it was flown around the world on a mission to verify orbiter communications systems and supporting ground stations prior to the first shuttle flight.

Some of its more common uses have included heavy aircraft training for shuttle pilots, leading the 747 Shuttle Carrier Aircraft during ferry flights back to KSC, and standing ready during missions to recover astronauts overseas in the event of a transatlantic landing.

Its principal role, however, has been providing

those precious 20 seconds of weightlessness for its inhabitants as they scramble into or out of a space suit, demonstrating new crew equipment, proving a procedure or design or simply exploring the dynamics of zero-g.

Flight Crew Operations Director Don Puddy said he feels the value of microgravity flight testing cannot be stressed enough.

"Our KC-135 microgravity operations have been essential to knowing that spacecraft systems and payloads will work and be productive the first time they are placed on-orbit," Puddy said. "It's a whole lot safer and a whole lot cheaper to check out a key system on the airplane, first, than to find out how it works in flight." Critical shuttle flight equipment ranging from the suits worn by astronauts during spacewalks to the orbital maneuvering system fuel tanks have been verified on test flights that average 60 per year.

The average two-hour zero-g mission consists of 40 parabolic maneuvers flown about 5 to 7 miles above the Gulf of Mexico. KC-135 zero-gravity program test director Bob Williams describes the maneuver as "a lot like a roller coaster ride."

"The pull-up begins in level flight at about 26,000 feet. The nose is gradually brought up at a rate of 2.5 degrees per second to a 45 degree nose-high attitude, inducing up to 1.8 gs in the process. Once at nose-high, the airplane is pushed over and into a controlled dive until it reaches a 45 degree nose-low attitude. It's during the push-over, which peaks at about 35,000 feet, that you start about 20 seconds of zero-gravity. After reaching the nose-low position, the airplane is pulled up to level flight, again, at the starting altitude. That process is repeated over and over again."

This aerobatic roller coaster ride has earned the airplane nicknames such as "the weightless wonder" and "the vomit comet."

"It does tend to make you aware of your stomach... and its contents. It's been known, on occasion, to humble even the strongest," said Williams.

NASA's weightless wonder is actually the fourth such aircraft ever operated in the United States. Three similar Boeing-built KC-135s were maintained and operated by the Air Force at Wright-Patterson Air Force Base from 1961 to

1973 when NASA, the Air Force's principal zero-g customer, took over the program and acquired NASA-930, still in service and flying high.

With the airplane came the Air Force program's civilian test director Don Griggs who, along with then-division chief Algranti, played a large part in laying the groundwork for the aircraft's long and illustrious career.

The first three Air Force zero-g planes each had been retired after 12,500-14,000 parabolas in compliance with structural load limits based on the g-forces experienced during pullout.

However, after extensive study and some aircraft modifications, a NASA/Boeing team made improvements to the maneuver itself to minimize the g-loads and extend the structural life of the aircraft indefinitely. The move clearly has paid off as NASA-930 approaches the 40k mark.

To celebrate the achievement, current and past KC-135 crews met at Ellington Field last week to swap stories, share memories, and honor nearly 20 years of flying. Two veteran NASA flyers attending the event can stake claim to more than half the maneuvers flown to date. Algranti and A.J. Roy, another of NASA's original KC-135 pilots, account for nearly 21,000 parabolas between them.

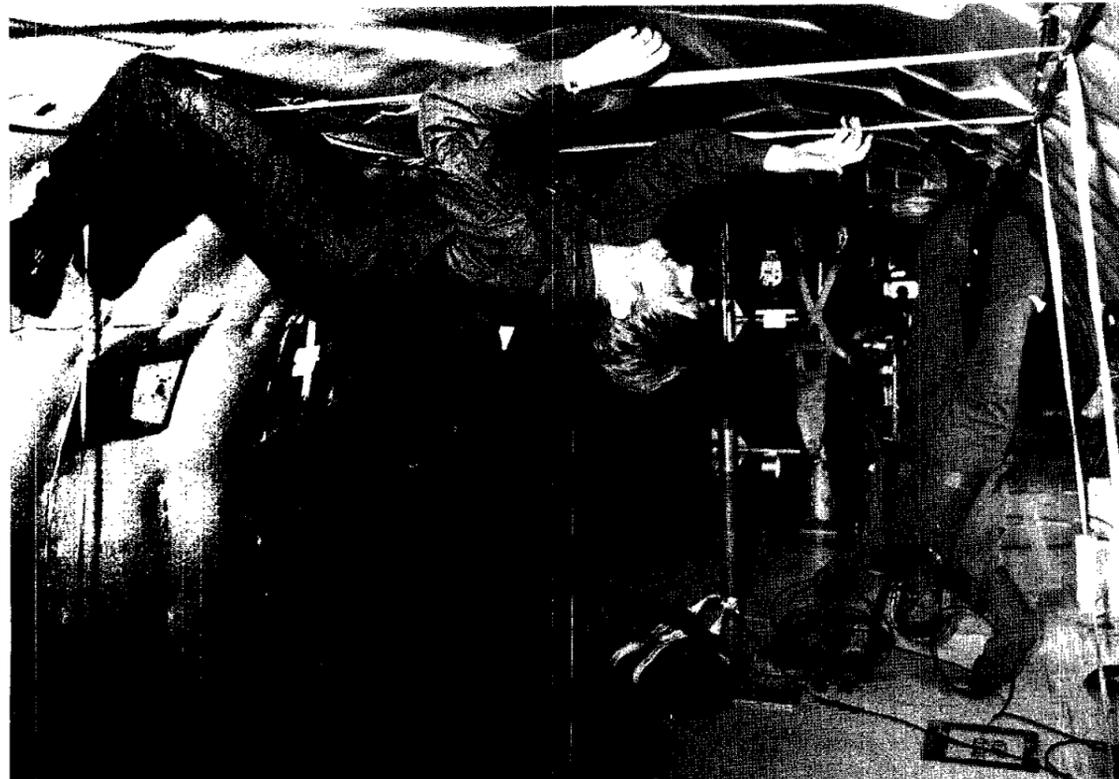
Puddy had praise for all, saying, "The small and dedicated team that has done this work over the years is to be commended for its outstanding efforts."

NASA-930's zero-g maneuver count stands at 39,700. After some routine inspection and maintenance, it is expected to eclipse the 40k mark before the end of this year.



It does tend to make you aware of your stomach... and its contents. It's been known, on occasion, to humble even the strongest.

—Zero-gravity Program Test Director Bob Williams



JSC Photos

Top: In 1979, the first space shuttle astronauts test donning and doffing procedures for extravehicular mobility unit space suits in the KC-135. Facing the camera, from left, are former program test director Don Griggs, current zero-gravity program test director Bob Williams, STS-1 Commander John Young and STS-1 Pilot Bob Crippen. Left: Payload Specialists Drew Gaffney, left, and Millie Hughes-Fulford of the upcoming STS-40 mission are introduced to weightlessness as an upside-down Williams watches. Above: Former astronaut Deke Slayton, Don Griggs and Joe Algranti discuss the airplane's illustrious career at last week's party.

Craig new deputy manager of New Initiatives

Jerry W. Craig has been assigned as deputy manager of the New Initiatives Office.

Craig will support the manager of the office, providing a focal point for all new initiatives and new program activities at JSC. He will continue to serve as manager of the Assured Crew Return Vehicle Project Office, as well.

Craig, who joined JSC in 1962, was deputy manager of the Space Station Projects Office before joining New Initiatives. He served in numerous senior program management positions before that, including stints as chief of the Systems Integration Branch in the Apollo Spacecraft Program Office and manager of the Power Extension Package Project.

Travel's 'Scotty' dies

John K. Scott, 58, a 20-year veteran of JSC's

travel office, died June 14 in Cookeville, Tenn., after a short illness. Services were held last week.

Known as "Scotty" to many NASA employees, Scott began working at JSC for Eastern Airlines in the Scheduled Airline Traffic Office (SATO) more than 20 years ago. He began working for Ask Mr. Foster when that company took over the contract in 1987.

Survivors include his wife, Barbara, of Friendswood, and two sons.

Krishen becomes chief technologist

Dr. Kumar Krishen has been appointed chief technologist in the New Initiatives Office. He will assist in planning advanced technology programs in support of strategic research and technology goals.

Krishen also represents JSC in developing strategies for joint research technology projects and plans with other NASA centers, universities and government agencies and represents JSC on the NASA Council on Science and Technology.

Krishen previously was assistant to the director of Mission Support for technology and advanced projects. He joined NASA in 1976 and has held various positions managing specific advanced programs. He also serves as an adjunct professor at Rice University in the area of wave propagation applications to vision and sensing.

Frick, first Apollo project manager, dies

Charles W. Frick Jr., of Los Altos, Calif., the



Craig



Scott



Krishen

year at age 76.

Frick, who was Apollo project manager from 1961 to 1963, began his government career in 1947 performing basic research in stability control, aeroelasticity and performance, and fluid mechanics for the National Advisory Committee on Aeronautics (NACA) at Ames Research Center. He left Ames to work for General Dynamics/Convair in San Diego. After leaving NASA, he worked 20 years for Ford Aerospace.

Survivors include his wife, Sarah, and three daughters.

JSC People

JSC employees earn suggestion, patent awards

JSC Deputy Director Paul J. Weitz recently presented Productivity Improvement, Patent and Suggestion Awards to 17 JSC employees.

The award ceremony was held June 11 in Bldg. 1.

Recipients of the Productivity Improvement Awards were:

Barry Plante for a Rewrite of the White Sands Test Facility's Pressure Vessel Management Instruction; and James F. Janney and F.A. Ferris for Deletion of Orbiter Vent Doors 4 and 7.

Patent Award winners were:

Timothy E. Fisher for Improved Architecture for Performing Coordinate Transforms; Dennis L. Wells for a Nozzle Fabrication Technique; Brian Morris for a Tank Gauging Apparatus and Method; Steven L. Koontz for a New Process for Anisotropic Photoresist Etching and Multi-Layer Lithography;

William E. Thornton Jr. for the method, sheet feeder and airflow valve involved in an Improved Method and Apparatus for Waste Collection and Storage; Richard L. Sauer for a Biofilm Monitoring Coupon System; Gerald R. Taylor for a Portable/Bedside Retinal Digital Image Analysis System; and Jeanne L. Crews and Burton G. Cour-Palais, for a New Hypervelocity Impact Shielding Concept/Design.

Suggestion Awards went to:

John F. Whiteley, for Production Process Tracking via Bar Codes; Rex A. Boyce for a Rubber Taper Pin Remover; Michael R. Helfert and Kamlesh P. Lulla for Economy/Cost Savings to NASA; and Lonnie D. Cundieff for a Simulator Crew Station Configuration.

Roundup to be delayed

The July 6 edition of Space News Roundup will not be distributed to many areas of the center until Monday, July 9.

The delay is caused by the Independence Day holiday, which falls on Wednesday, a prime production day for the JSC newspaper.



"Robby," a prototype rover vehicle for semi-autonomous navigation experiments, picks its way through a dry river bed near NASA's Jet Propulsion Laboratory in Pasadena, Calif.

JPL field tests planetary rover

Prototype to help develop manned, unmanned systems

Scientists and engineers at NASA's Jet Propulsion Laboratory (JPL) have begun extensive field tests of a semi-autonomous navigation system on a computer-operated robotic rover for possible use in future planetary explorations.

Brian Wilcox, supervisor of the Robotic Sensing and Perception Group, said the summer-long testing program would be carried out mostly in the Pasadena Arroyo, a dry river bed, adjacent to JPL.

JPL's prototype rover made its first, continuous semi-autonomous navigation (SAN) traverse over rough natural terrain May 7.

The navigation testbed is a six-wheeled, three-body, articulated vehicle the experimenters call "Robby." It is about 13-feet long, 5-foot wide and more than 6.5-feet high. Its 35-inch diameter wheels and articulated body permit it to go over obstacles a meter high.

Developing new technologies, including a new generation of planetary rovers, is seen as critical to the success and cost effectiveness of the Space Exploration Initiative (SEI) program. The Planetary Rover project will develop systems for the manned and

unmanned vehicles needed for surface transportation.

Unmanned rovers are needed for outpost site survey and for regional robotic exploration and science, and piloted rovers for transportation both locally and long range, and unmanned cargo handling, construction and mining.

Operating an autonomous unmanned rover in remote locations such as Mars, with a round-trip communications time of between 8 and 40 minutes, involves unproven technology.

Two advanced forms of unmanned rover navigation are under development at JPL. They are computer-aided remote driving (CARD) and semi-autonomous navigation (SAN). The CARD technique allows a human operator to remotely drive a vehicle by planning and identifying an extended (10s of meters) obstacle-free path with images from stereo cameras aboard the vehicle.

The SAN technique allows a human operator to determine a nominal extended route for the vehicle, with the specific path taken by the vehicle around obstacles determined automatically by the rover.

Longer turn lane should ease traffic

Traffic entering the center through the JSC Credit Union gate should move quicker after this weekend when road crews will lengthen the inbound left turn lane.

Center Operations Director Ken Gilbreath said the need for the change became obvious when morning traffic into the center started backing up as far as Gemini.

The problem was that the mostly two-lane road's left turn lane didn't begin until just before the Second Street intersection. Gilbreath said the reason for the recent surge in traffic on Avenue E isn't precisely known, but he suspects that out-of-sync lights on NASA Road 1 are forcing some drivers to change routes.

The solution was tested this week when Center Operations personnel formed a longer left turn lane using hazard cones. The change makes Avenue E a three-lane road for about 400 yards, extending the left turn lane back to the vicinity of the drainage canal bridge. This allows more cars to line up side-by-side at the intersection.

"The first day, drivers were pretty confused, but by the second and third days it was working well," said Garlan Moreland, deputy director of the Plant Engineering Division.

Under the new arrangement, traffic in the right lane still may turn right, go forward or turn left but traffic in the left lane must turn left.

Gilbreath said the success of the test led to a decision to make the changes permanent this weekend. Crews will cover the existing roadway and protect the shoulder with a new asphalt cap. Then, new divider lines will be painted.

It may be Monday or Tuesday before the line painting is completed.

Atlantis readied

(Continued from Page 1)

for normal operations.

Atlantis was powered down while technicians reconfigured the system supplying cooled air to the LCC.

Once the system was back up, nitrogen tetroxide was loaded into the orbiter's on-board storage tanks. Loading of monomethylhydrazine was completed Wednesday. This operation also includes loading hydrazine into the orbiter's auxiliary power units and in the solid rocket booster hydraulic power units.

Launch of Atlantis on its seventh mission was scheduled for about July 15 prior to the managers' launch decision which is based on the readiness of the vehicle, crew and flight control team to support the mission.

Hubble Space Telescope still able to make fundamental discoveries

(Continued from Page 1)

in a mirror does not focus precisely at the same point.

The HST is a cassegrain design, which means light enters its tube, bounces off a primary mirror and then up to a smaller, secondary mirror mounted near the opening of the tube. From there, the light is reflected back through a hole in the primary

mirror and brought to a focus. With a mirror that suffers spherical aberration, light rays do not converge at a single point. Instead, they converge to a series of points depending on how far from the center of the mirror the light strikes, resulting in a blurry image.

"What we suspect is that in the techniques used to measure the

figure of the mirror and polish it and hold it steady... somewhere in this chain there was a mistake or error made that resulted in the mirror being very precisely made but ultimately to the wrong figure," Olivier said.

Specifications called for the telescope to focus 70 percent of a star's light into a certain area. With the aberration only 20 to 30 percent of

the energy falls in the specified area.

Engineers and project scientists will continue to analyze what effect the problem will have on Hubble's five scientific instruments.

Dr. Lennard Fisk, NASA associate administrator for space science, said the setback will not prevent scientists using Hubble from making fundamental discoveries using instruments

no affected by the aberration.

HST was deployed from Discovery on April 25 and has encountered a variety of problems that have slowed the telescope's activation. Unexpected wobbling motions, trouble with data relay antennas and problems with the telescope's ultra-precise tracking system have caused delays in the HST's checkout.

Simulators to test updated shuttle computers

(Continued from Page 1)

the existing memory capacity and up to three times the existing processor speed with a minimum impact on current flight software. They are half the size and, at 64 pounds each, they weigh half as much as the older models. They also require less power.

"There will be much more memory capability on the new computers which will increase the crew's reac-

ces on orbit," he said.

Kaylene Kindt, GPC subsystems manager, began working on the project in 1985. Work continued in the JSC Avionics Engineering Laboratory (JAEL) and the Shuttle Avionics Integration Laboratory (SAIL).

"I've seen the computer go from a silicon chip to where it is today," she said. "A lot of us have been with this project for many years and we're going

to be really happy to see it fly. We have a lot of confidence in this hardware."

IBM Corp. built the hardware and provided the ground-based units used in Bldg. 5. Rockwell's Space Transportation System Operations Contract (STSOC) and the LINK Flight Simulation Corp.'s Training Support Contract supported the project.

The upgraded GPCs are to be shipped to JSC for installation this fall.

Space News Roundup

The Roundup is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every Friday by the Public Affairs Office.

Editor Kelly Humphries
Associate Editors Pam Alloway
Kari Fluegel

Robot laboratory

(Continued from Page 1)

to space station maintenance studies, an evaluation of future robotics applications in space will be conducted by the consortium.

"We can be of great benefit to the Space Station Freedom Program," de Figueiredo said. "And the importance of the work, along with its posture on the cutting edge of robotics, will provide a strong motivation and a sense of real accomplishment for our students."